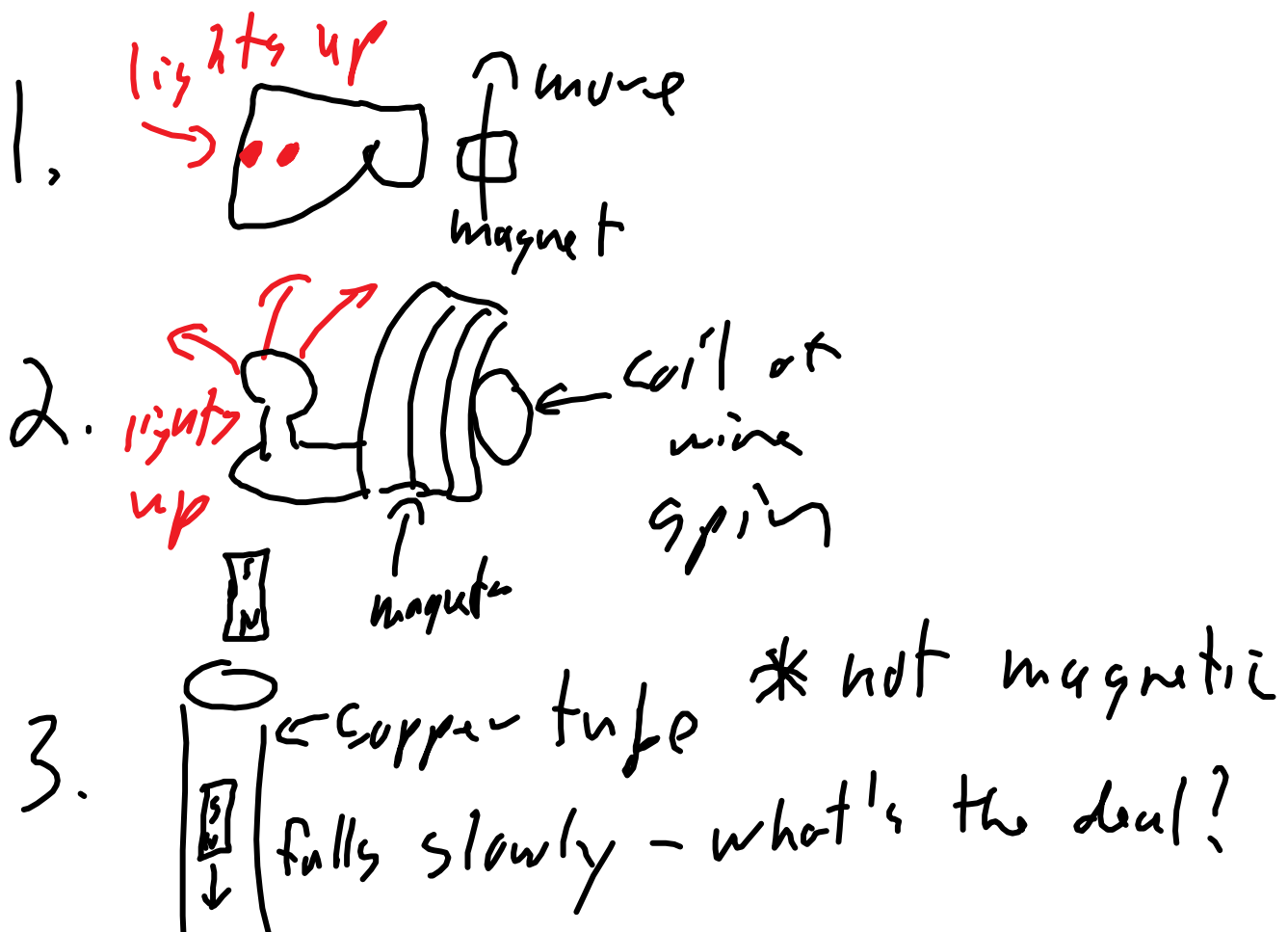


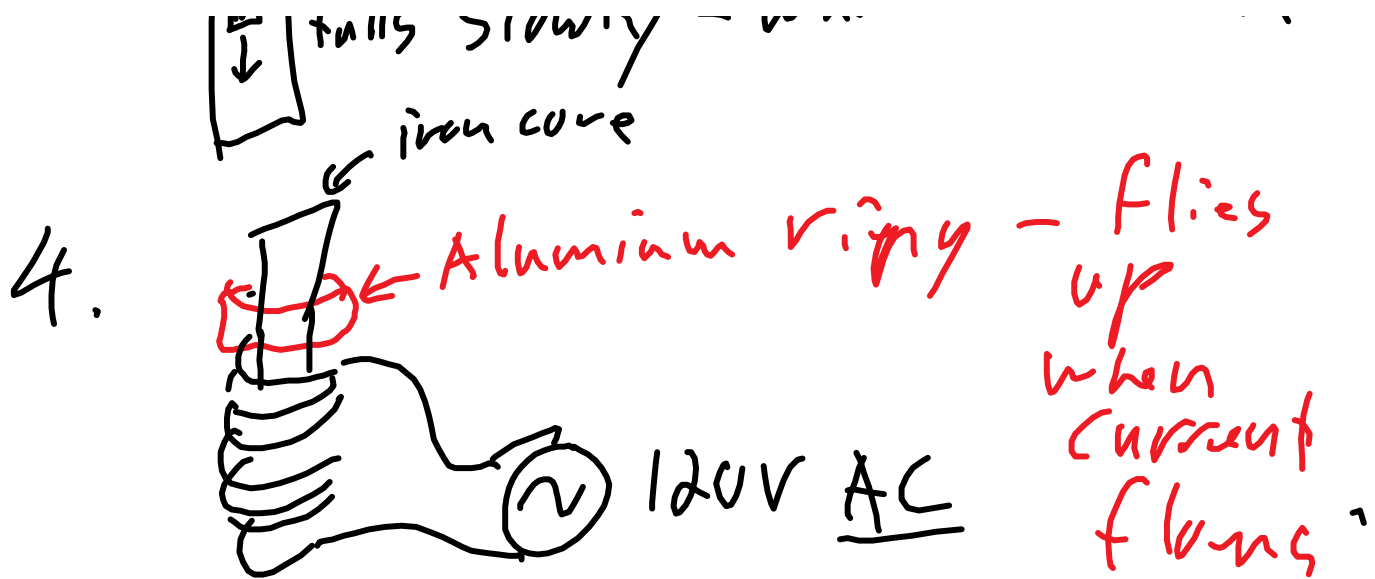
Electromagnetic Induction

Demos:

1. Coil of wire connected to LED with magnet - magnet moving near wire.
2. Moving coil in magnet - generator
3. Dropping magnet into copper tube
4. Solenoid connected to AC power and aluminum ring.

Write observations and ideas.

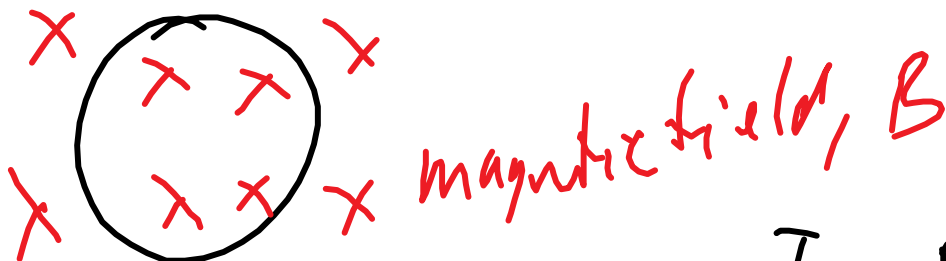




We will discuss next class.

Let's see if you can derive from Lenz's Law:

coil of wire, area A



magnetic flux $\Phi = B A \cos \theta$

θ is the angle between B and the normal to A .

Φ

- max when



Φ

min



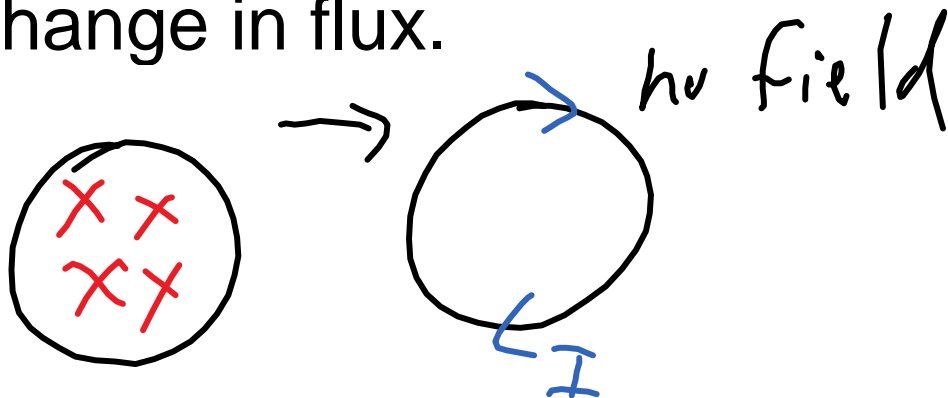
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units: Weber, $Wb = T m^2$

flux density = B

If you change A or B, the flux changes and you observe that a current is induced in the coil of wire.

The direction of the current is such to create magnetic field that opposes the change in flux.



the induced current will create a field opposing the change, so it will create a field into the page. A clockwise current creates a field into the page.

$$\text{induced emf} = -N\Delta\Phi/\Delta t$$

N is the number of loops

Φ is the flux = $BA\cos\theta$, in $\text{Wb} = \text{Tm}^2$

t is time, in seconds, s

the negative sign just indicates that it opposes the change

eg. 1. 50 circular loops of wire with radius 5.0 cm is placed in a magnetic field that starts out of the page with 0.15T and changes steadily to 0.20T into the page over 2.0 s. What is

a) starting flux?

b) the ending flux?

c) the average induced emf?

d) the magnitude and direction of the current in the wire if it has a resistance of 4.0Ω ?

2. A square loop of wire is pulled out of a 0.15T field. If the square has sides of 10.0cm and is pulled at 5.0 m/s what is the force required?

P566 Q5, 2, 4, 7,